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Modeling the Effects of Maintenance Capabilities on Aircraft Operations

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Air Force Logistics Management Agency

Modeling the Effects of Maintenance Capabilities on Aircraft Operations

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Integrity - Service - Excellence

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Overview

- **Background**
  - **Aircrew/Aircraft Tasking System (AATS)**
  - **AFLMA Study**
- **Modeling Maintenance Capabilities**
  - **Net Effective Personnel (NEP)**
- **What is the effect?**

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AATS

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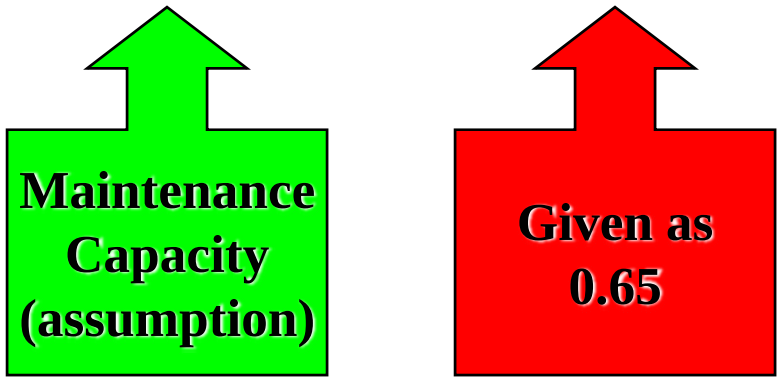
AATS

- **AATS allocates Air Mobility Command (AMC) aircrews and aircraft among AMC wings and the Tactical Airlift Control Center (TACC)**
  - **TACC schedules Transportation Command (TRANSCOM) taskings and other operational missions**
  - **Each wing must support wing training and other mission directed requirements**
  - **The remaining balance of aircraft is made available for maintenance, *i.e.* maintenance withhold (MW)**

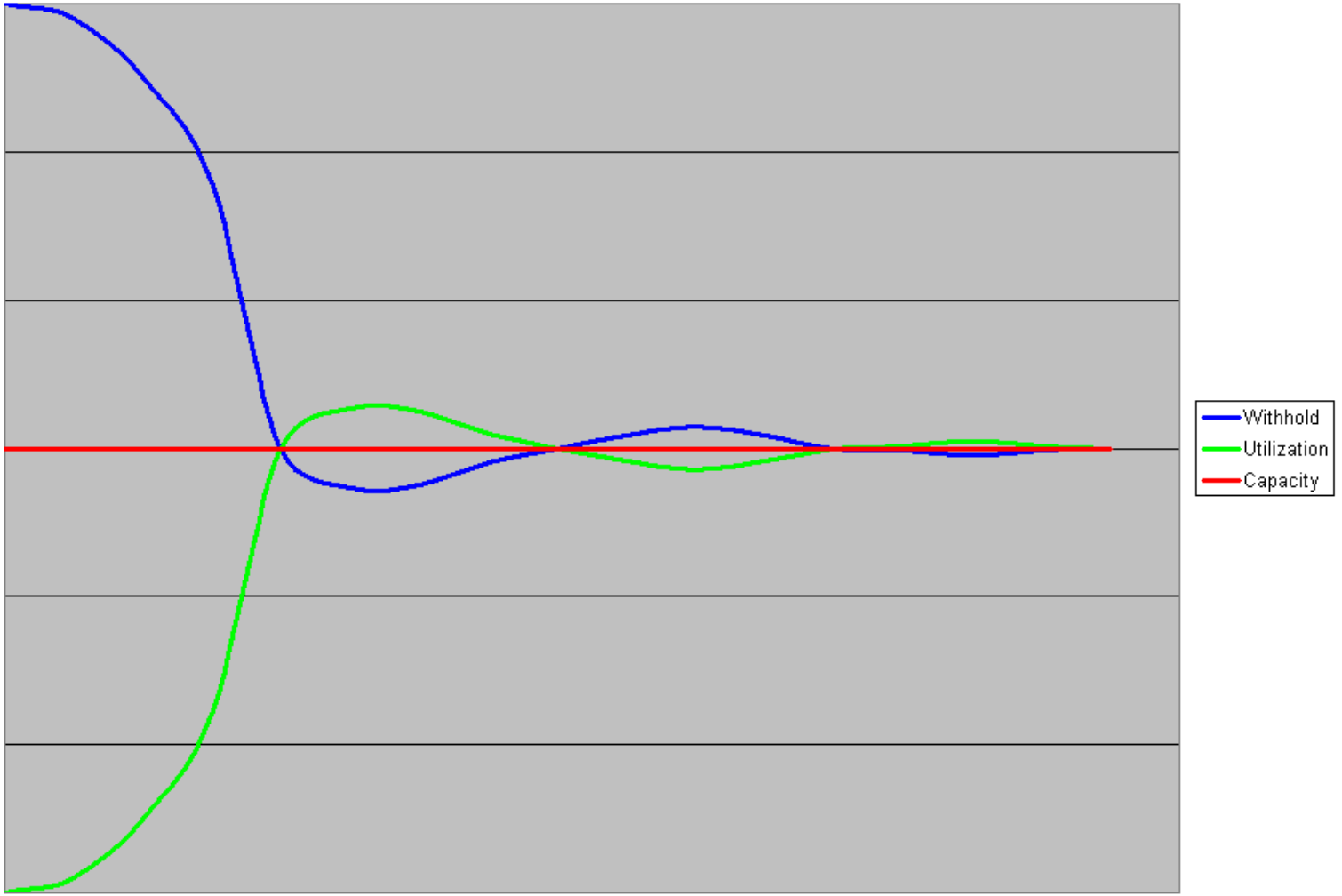
How does AATS determine MW?

Maintenance Withhold =

(Avg Possessed - Deployed)*(1 - Commitment Threshold)



Effect of Maintenance Withhold



Modeling Maintenance Capacity (MC)

- **Typically calculated with Assigned/Authorized**
  - **Good initial indicator**
  - **Does not account for skill levels of the personnel**
  - **Does not account for daily availability of the personnel**
- **AATS assumes MC = 1**
- **Is there a better way?**

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AFLMA Study

Study Drivers

- **AMC employs the Aircrew/Aircraft Tasking System which is designed to balance AMC aircrew and aircraft allocations against operational and training requirements.**
- **This process does not take into account a unit's maintenance capabilities based on current workload, available manpower, experience, or skill level.**

AFLMA Study Objectives

- **Develop a formula that illustrates maintenance skill-levels impacting aircraft generation**
  - **Define maintenance capabilities**
  - **Determine key variables that affect maintenance capabilities**
  - **Explore other efforts to address maintenance skill level and aircraft generation**
- **Propose an amendment to the current AATS formula that takes into account maintenance capabilities**
- **Discuss the possible effect of the formula on aircraft availability**

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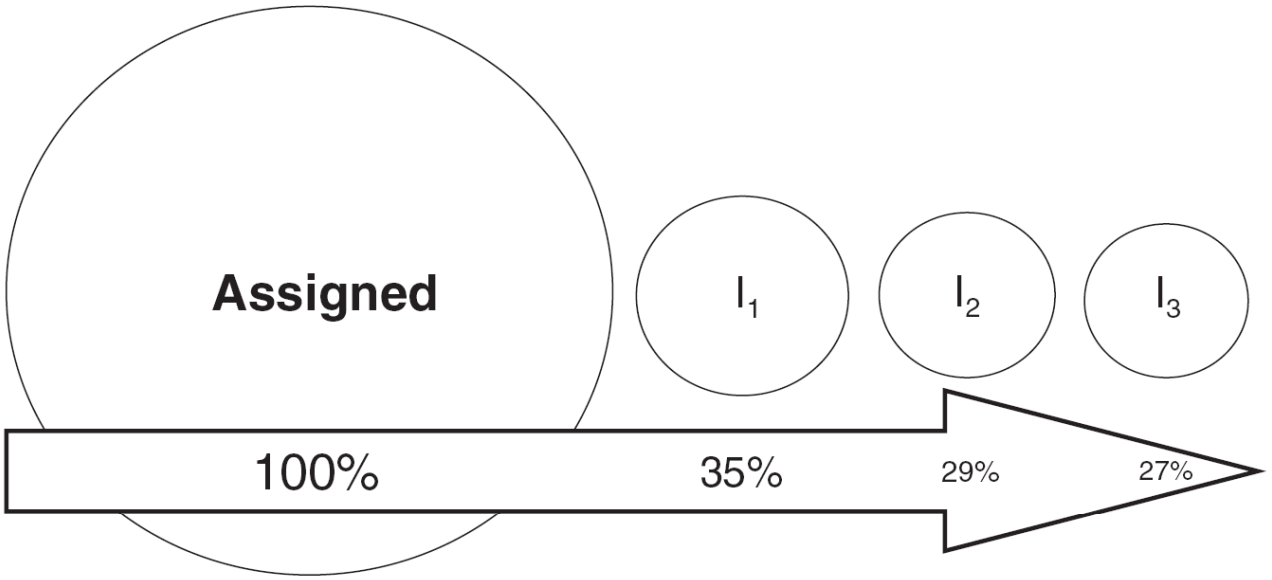
Results

Net Effective Personnel (NEP)

- **NEP takes authorized vs. assigned one step further**
  - **Also takes into account**
    - **Skill-level productivity**
    - **Ancillary and computer-based training (CBT) requirements**
    - **Personnel availability**
- **Methodology developed for C-5 TNMCM Study**
  - Study team developed a representation of the effective personnel resource pool
  - Account for the realities of availability and productivity
  - Allow the resource pool to be viewed objectively
  - Mechanism for comparing maintenance capacity with demand

How is NEP calculated?



- Iteration 1 (I_1) : Availability
  - $A_{75NT} + A_{75T} + A_3$
- Iteration 2 (I_2) : Availability and Productivity
  - $A_{75NT} + P_tA_{75T} + P_eA_3$
- Iteration 3 (I_3) : Availability, Productivity, CBT and Ancillary Training
  - $T_{75}(A_{75NT} + P_tA_{75T}) + T_3(P_eA_3)$

Howe, et al., "Beyond Authorized Versus Assigned: Aircraft Maintenance Personnel Capacity", *Air Force Journal of Logistics*, Vol. XXXI, No. 4, Winter 2007/2008, Figure 4, P25.

The MC adjustment

$$NEP = T_{75}(A_{75NT}+(P_T*A_{75T}))+T_3\ (P_E\ A_3)$$

Possible NEP hours = NEP * Total Quarterly Hours

$$\frac{\text{Possible NEP Hours}}{\text{Actual Hours Worked}} = \frac{\text{Quarterly Hours Available}}{\text{Adjustment}}$$

$$\text{Adjustment} = \frac{\text{Quarterly Hours Available * Actual Hours Worked}}{\text{Possible NEP Hours}}$$

New MW Calculation

New MW =

(Avg Poss. – Dep.)*(1 ± adj. - Commitment Threshold)

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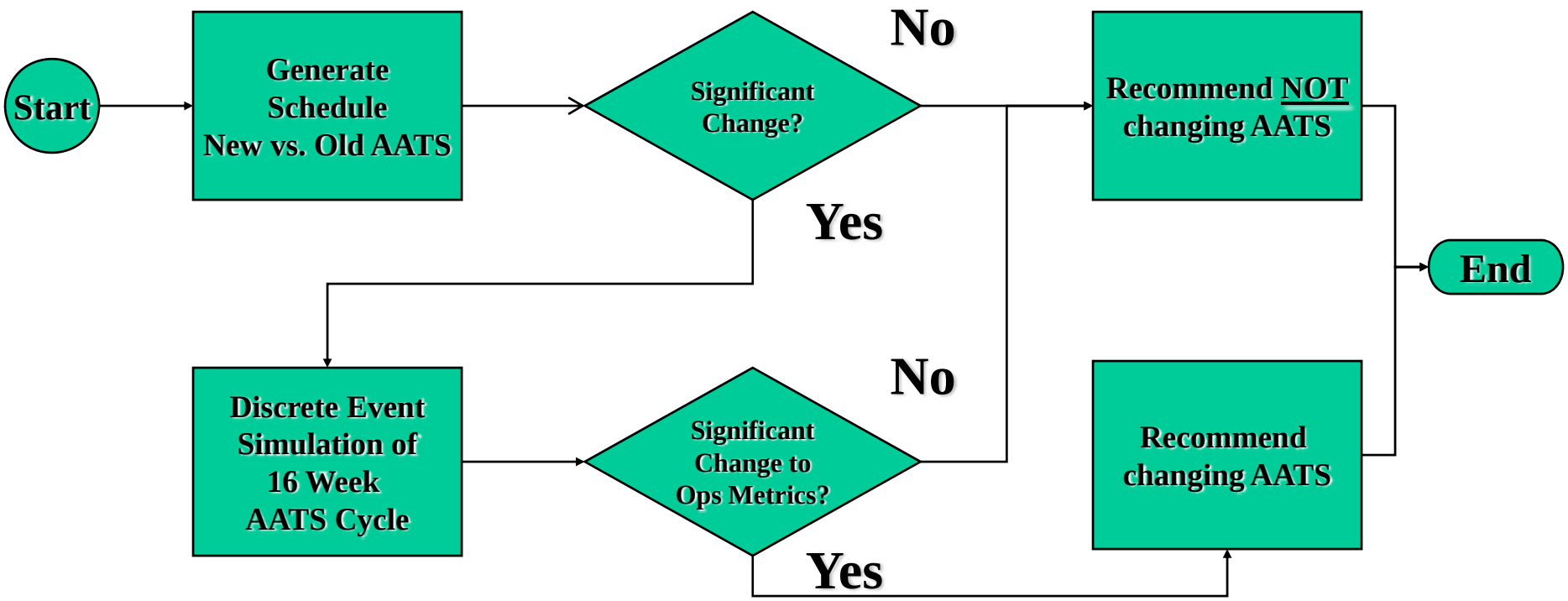
Operational Effects

Effect on Operational Metrics

- **Metrics of Interest**
  - **Aircraft break rate**
  - **Repair rate**
  - **Mission capable rate**
  - **Aircraft availability rate**
  - **Not mission capable maintenance rate**
  - **Not mission capable supply rate**
  - **Not mission capable both rate**
- **How to Capture**
  - **Base Level Test**
    - **Expensive**
  - **Simulation**

Effect on Operational Metrics



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Discrete Event Simulation

- **Cooperative Research and Development Agreement (CRADA) is in coordination with Boeing**
  - **Boeing Aircraft Operations Methodology**
  - **Extend Simulation Software**

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Any Questions?